

**CLAIMS:***Sub A81*

1 A timer management system for managing timers in both a synchronous and asynchronous  
2 system comprising:

3 an application program interface (API) providing a set of synchronous functions allowing an  
4 application to functionally operate a timer;

5 a timer database for storing timer-related information; and

6 a timer services detecting the expiring of said timer, wherein a handle function of said timer  
7 services allows said application to act on an expired timer without incurring an illegal time-out  
8 message.

2. The timer management system as recited in claim 1, wherein said application performs the  
2 following operations on said timer via said API:

3 creating said timer from an allocated block of system memory;

4 activating said timer; and

5 reinitializing said timer using said allocated block of system memory.

1 3. The timer management system as recited in claim 1, wherein said application performs the  
2 following operation on said timer via said API:

3 creating said timer from an allocated block of system memory; and

4 activating said timer;

1       wherein said timer expires and said timer services sends synchronously a time-out message  
2       to said application, wherein said time-out message is sent using said allocated block of system  
3       memory.

1       4.       The timer management system as recited in claim 1, wherein said application performs the  
2       following operation on said timer via said API:

3               creating said timer from an allocated block of system memory; and  
4               activating said timer;  
5       wherein said timer expires and said timer services sends a time-out message to a particular  
6       queue, wherein said timer is an expired state in an asynchronous state machine.

1       5.       The timer management system as recited in claim 4, wherein said particular queue is a system  
2       queue attached to said application.

1       6.       The timer management system as recited in claim 4, wherein said application receives said  
2       time-out message, wherein said handle function transfers said timer from said expired state in said  
3       asynchronous state machine to an idle state in a synchronous state machine, wherein said handle  
4       function allows said application to synchronously act on said timer.

1       7.       The timer management system as recited in claim 4, wherein said application stops said  
2       timer, wherein said timer is in an idle state in said asynchronous state machine with said time-out  
3       message being queued.

1 8. The timer management system as recited in claim 7, wherein said time-out message is  
2 dequeued, wherein said handle function transfers said timer from said idle state in said asynchronous  
3 state machine to an idle state in a synchronous state machine, wherein said handle function allows  
4 said application to synchronously act on said timer.

1 9. The timer management system as recited in claim 7, wherein said timer is deleted by said  
2 application, wherein said timer is in a state in said asynchronous state machine in which said timer  
3 is deleted and said time-out message is queued, wherein said time-out message is dequeued, wherein  
4 said handle function transfers said timer from said state in said asynchronous state machine in which  
5 said timer is deleted and said time-out message is queued to a non-existent state in a synchronous  
6 state machine, wherein said handle function allows said application to synchronously act on said  
7 timer.

1 10. The timer management system as recited in claim 7, wherein said timer is activated by said  
2 application, wherein said timer is in a running state in said asynchronous state machine with said  
3 time-out message being queued.

1 11. <sup>9</sup> The timer management system as recited in claim 10, wherein said timer is deleted by said  
2 application, wherein said timer is in a state in said asynchronous state machine in which said timer  
3 is deleted and said time-out message is queued, wherein said time-out message is dequeued, wherein  
4 said handle function transfers said timer from said state in said asynchronous state machine in which  
5 said timer is deleted and said time-out message is queued to a non-existent state in a synchronous

1 state machine, wherein said handle function allows said application to synchronously act on said  
2 timer.

1 12. *✓ a* The timer management system as recited in claim 10, wherein said timer is stopped by said  
2 application, wherein said timer is in said idle state in said asynchronous state machine with said  
3 time-out message being queued, wherein said time-out message is dequeued, wherein said handle  
4 function transfers said timer from said idle state in said asynchronous state machine to an idle state  
5 in a synchronous state machine, wherein said handle function allows said application to  
6 synchronously act on said timer.

1 13. The timer management system as recited in claim 10, wherein said time-out message is  
2 dequeued, wherein said handle function transfers said timer from said running state in said  
3 asynchronous state machine to a running state in a synchronous state machine, wherein said handle  
4 function allows said application to synchronously act on said timer.

1 14. The timer management system as recited in claim 4, wherein said application deletes said  
2 timer, wherein said timer is in a state in said asynchronous state machine in which said timer is  
3 deleted and said time-out message is queued, wherein said time-out message is dequeued, wherein  
4 handle function transfers said timer from said state in said asynchronous state machine in which said  
5 timer is deleted and said time-out message is queued to a non-existent state in a synchronous state  
6 machine, wherein said handle function allows said application to synchronously act on said timer.

1 15. The timer management system as recited in claim 4, wherein said application activates said  
2 timer, wherein said timer is in a running state in said asynchronous state machine with said time-out  
3 message being queued.

1 16. The timer management system as recited in claim 15, wherein said timer is deleted by said  
2 application, wherein said timer is in a state in said asynchronous state machine in which said timer  
3 is deleted and said time-out message is queued, wherein said time-out message is dequeued, wherein  
4 said handle function transfers said timer from said state in said asynchronous state machine in which  
5 said timer is deleted and said time-out message is queued to a non-existent state in a synchronous  
6 state machine, wherein said handle function allows said application to synchronously act on said  
7 timer.

1 17. The timer management system as recited in claim 15, wherein said timer is stopped by said  
2 application, wherein said timer is in an idle state in said asynchronous state machine with said  
3 time-out message being queued, wherein said time-out message is dequeued, wherein said handle  
4 function transfers said timer from said idle state in said asynchronous state machine to an idle state  
5 in a synchronous state machine, wherein said handle function allows said application to  
6 synchronously act on said timer.

1 18. The timer management system as recited in claim 15, wherein said time-out message is  
2 dequeued, wherein said handle function transfers said timer from said running state in said  
3 asynchronous state machine to a running state in a synchronous state machine, wherein said handle  
4 function allows said application to synchronously act on said timer.

1 19. The timer management system as recited in claim 1, wherein said API is a DLL file.

1 20. A method for managing timers in both a synchronous and asynchronous system comprising  
2 the steps of:

3 creating a timer from an allocated block of system memory by an application via an  
4 application program interface (API);

5 activating said timer;

6 expiring of said timer; and

7 sending a time-out message to a particular queue when said timer expires, wherein said timer  
8 is an expired state in an asynchronous state machine, wherein a handle function allows said  
9 application to act on said expired timer without incurring an illegal time-out message.

1 21. The method as recited in claim 20, wherein said particular queue is a system queue attached  
2 to said application.

1 22. The method as recited in claim 20 further comprising the step of:

2 receiving said time-out message by said application, wherein said handle function transfers  
3 said timer from said expired state in said asynchronous state machine to an idle state in a  
4 synchronous state machine, wherein said handle function allows said application to synchronously  
5 act on said timer.

1 23. The method as recited in claim 20 further comprising the step of:

2 stopping said timer by said application, wherein said timer is in an idle state in said  
3 asynchronous state machine with said time-out message being queued.

1 24. The method as recited in claim 23, wherein said time-out message is dequeued, wherein said  
2 handle function transfers said timer from said idle state in said asynchronous state machine to an idle  
3 state in a synchronous state machine, wherein said handle function allows said application to  
4 synchronously act on said timer.

1 25. The method as recited in claim 23 further comprising the step of:  
2 deleting said timer by said application, wherein said timer is in a state in said asynchronous  
3 state machine in which said timer is deleted and said time-out message is queued, wherein said  
4 time-out message is dequeued, wherein said handle function transfers said timer from said state in  
5 said asynchronous state machine in which said timer is deleted and said time-out message is queued  
6 to a non-existent state in a synchronous state machine, wherein said handle function allows said  
7 application to synchronously act on said timer.

1 26. The method as recited in claim 23 further comprising the step of:  
2 activating said timer by said application, wherein said timer is in a running state in said  
3 asynchronous state machine with said time-out message being queued.

1 27. The method as recited in claim 26 further comprising the step of:  
2 deleting said timer by said application, wherein said timer is in a state in said asynchronous  
3 state machine in which said timer is deleted and said time-out message is queued, wherein said  
4 time-out message is dequeued, wherein said handle function transfers said timer from said state in  
5 said asynchronous state machine in which said timer is deleted and said time-out message is queued

1 to a non-existent state in a synchronous state machine, wherein said handle function allows said  
2 application to synchronously act on said timer.

1 28. The method as recited in claim 26 further comprising the step of:  
2 stopping said timer by said application, wherein said timer is in said idle state in said  
3 asynchronous state machine with said time-out message being queued, wherein said time-out  
4 message is dequeued, wherein said handle function transfers said timer from said idle state in said  
5 asynchronous state machine to an idle state in a synchronous state machine, wherein said handle  
6 function allows said application to synchronously act on said timer.

1 29. The method as recited in claim 26, wherein said time-out message is dequeued, wherein said  
2 handle function transfers said timer from said running state in said asynchronous state machine to  
3 a running state in a synchronous state machine, wherein said handle function allows said application  
4 to synchronously act on said timer.

1 30. The method as recited in claim 20 further comprising the step of:  
2 deleting said timer by said application, wherein said timer is in a state in said asynchronous  
3 state machine in which said timer is deleted and said time-out message is queued, wherein said  
4 time-out message is dequeued, wherein said handle function transfers said timer from said state in  
5 said asynchronous state machine in which said timer is deleted and said time-out message is queued  
6 to a non-existent state in a synchronous state machine, wherein said handle function allows said  
7 application to synchronously act on said timer.

1       31. The method as recited in claim 20 further comprising the step of:  
2           activating said timer by said application, wherein said timer is in a running state in said  
3           asynchronous state machine with said time-out message being queued.

1       32. The method as recited in claim 31 further comprising the step of:  
2           deleting said timer by said application, wherein said timer is in a state in said asynchronous  
3           state machine in which said timer is deleted and said time-out message is queued, wherein said  
4           time-out message is dequeued, wherein said handle function transfers said timer from said state in  
5           said asynchronous state machine in which said timer is deleted and said time-out message is queued  
6           to a non-existent state in a synchronous state machine, wherein said handle function allows said  
7           application to synchronously act on said timer.

1       33. The method as recited in claim 31 further comprising the step of:  
2           stopping said timer by said application, wherein said timer is in an idle state in said  
3           asynchronous state machine with said time-out message being queued, wherein said time-out  
4           message is dequeued, wherein said handle function transfers said timer from said idle state in said  
5           asynchronous state machine to an idle state in a synchronous state machine, wherein said handle  
6           function allows said application to synchronously act on said timer.

1       34. The method as recited in claim 31, wherein said time-out message is dequeued, wherein said  
2           handle function transfers said timer from said running state in said asynchronous state machine to  
3           a running state in a synchronous state machine, wherein said handle function allows said application  
4           to synchronously act on said timer.